

The Effects of Textual Prompting and Reading Fluency on the Acquisition of Intraverbals

Jill R. Emmick, Traci M. Cihon, and John W. Eshleman,
The Chicago School of Professional Psychology

The study examined the effects of textual prompt fading on the acquisition of intraverbals in 3 individuals with developmental disabilities. An alternating treatments design was used to assess the two independent variables. The first independent variable was transfer of stimulus control without component skill fluency. The second independent variable was transfer of stimulus control with component skill fluency, in which participants were taught the textual responses used in the scripts to a level of fluency prior to transfer of stimulus control. The results suggest that transfer of stimulus control was effective for teaching intraverbals and that adding a fluency component resulted in faster acquisition for some participants.

Key words: developmental disabilities, fluency, intraverbal, textual, transfer of stimulus control, verbal behavior

Cihon (2007) reviewed the literature regarding the methods used to establish intraverbal repertoires and noted that the following techniques were most cited: peer-mediated interventions, transfer of stimulus control, video modeling, discrete-trial training, and precision teaching. She suggested that although these tactics seem to be effective for teaching intraverbals, there are several limitations in their application. One suggestion for improvement was the addition of precision teaching. Cihon indicated that precision teaching could offer the following benefits: achievement of higher levels of fluency in responding, assessment of maintenance and generalization, and a means for examining the entire verbal operant. That is, participants may need to be fluent in the component skills necessary for textual responding, especially when scripts are used to teach intraverbal responses. The addition of fluency-based instruction on component

skills before using scripts to teach composite skills may strengthen the outcomes associated with script fading and transfer of stimulus control procedures. Merbitz, Vieitez, Merbitz, and Binder (2004) asserted that all visible behavior is comprised of smaller component behaviors that, if performed fluently, expedite instruction on the more complex composite behaviors.

Component-composite relations are a sub-component of precision teaching, which was founded by Ogden Lindsley (1972). Precision teachers use the standard celeration chart to monitor frequencies over real calendar time; the chart provides a standard visual display of behavior change to rate (Pennypacker, Gutierrez, & Lindsley, 2003). Binder (1996) suggested that behavior rates, when combined with accuracy, yield both fluent repertoires and some of the greatest gains in behavior change. Once individuals are able to emit a skill fluently, they are said to be proficient at this particular skill (Starlin, 1971). In addition, a skill that is fluent may be maintained over long periods of time even with distractions (Binder, Haughton, & Van Eyk, 1990). Precision teachers acknowledge that certain skills, such as intraverbals, must be fluent in order to build more complex skills (Johnson & Layng, 1994). Johnson and Layng have called this process the “generative” effect, because once behavioral repertoires are brought to a level of fluency, this will aid

Jill Emmick is now at Behavior Analysis and Therapy, and Traci Cihon is now at the University of North Texas. This study is based on the first author's thesis completed under the supervision of the second and third authors in partial fulfillment of the MA degree at the Chicago School of Professional Psychology. The study was presented at the 2009 ABAI conference in Phoenix, AZ.

Address correspondence to Traci M. Cihon, Department of Behavior Analysis, The University of North Texas, 1155 Union Circle #310919, Denton, Texas 76203 (e-mail: traci.cihon@unt.edu).

in learning new behaviors. In essence, new behaviors can be generated.

Several researchers have examined the role of using text or echoic cues to establish multiply controlled textual–intraverbal or echoic–intraverbal relations without focusing on the frequency of the response (Finkel & Williams, 2001; Krantz & McClannahan, 1993, 1998; Vedora, Meunier, & Mackay, 2009). Finkel and Williams and Vedora et al. noted the superiority of textual cues over echoic cues for transferring control to intraverbal controlling stimuli. However, Finkel and Williams included only 1 participant and did not conduct generalization probes. Moreover, Vedora et al. did not include formal generalization and maintenance probes, had only a small number of participants, and did not control for response effort associated with the intraverbal responses.

To consider an intraverbal repertoire effective, it is essential that the learner be able to emit a response within a few seconds. Otherwise the learner risks losing the audience's attention. To expedite the acquisition of intraverbals with script fading or transfer of stimulus control procedures, the individual's textual responding may need to be brought to fluent levels before intervention.

The current study examined the relation between component skills fluency instruction and textual prompt fading. The specific research questions were as follows: (a) Is there a benefit to adding a fluency component to textual prompt fading for the acquisition of intraverbals? (b) Can the findings be replicated across participants and responses? (c) Once the intraverbal responses are acquired, will they be emitted in the presence of novel people and novel vocal verbal stimuli?

METHOD

Participants

Three boys participated. Jack was a 15-year-old Caucasian boy with autism who engaged in echolalia. When asked socially relevant questions, he responded with a one- to two-word response or repeated the question. John was a 14-year-old Caucasian boy with Down syndrome. He was able to

respond appropriately to some verbal stimuli, but would often drift to an unrelated topic. In addition, he was difficult to understand because he spoke too rapidly and did not clearly articulate his responses. Chris was a 6-year-old Caucasian boy with autism. Each participant's basic textual repertoire was determined by asking him to read through a list of short sentences and several short stories. All 3 participants were able to read all the stories and sentences without difficulty.

Setting and Materials

The first author conducted all sessions for John and Jack in a residential facility that serves individuals with cognitive impairments, maladaptive behaviors, or deficits in vocational skills. Individual sessions were conducted in the first author's office at least three times per week. A behavior therapist or the first author conducted Chris's sessions at his residence at the kitchen table. Worksheets (45 words, three columns), textual prompts (white paper, 18-point black font), and a timer (fluency sprints only) were used during teaching sessions.

Assessments

The intraverbal responses selected were based on reports from the direct-care staff and caregivers (see Tables 1, 2, and 3) who identified at least 10 questions or statements that the participants did not respond to. The individualized responses incorporated activities, items, and people that each participant came into contact with on a daily basis. Each verbal stimulus was presented three times, with no differential consequences contingent on correct or incorrect intraverbal responses. The intraverbals used in intervention were selected if the participant made an incorrect response two of the three times the stimulus was presented.

Experimental Design

An alternating treatments design (Barlow & Hayes, 1979) was used. Fluency timings were conducted first. Once the participant had reached his frequency aim (79 to 90 words per minute with no errors), transfer of

Table 1
Intraverbal Responses Used During Each Condition for Chris

Intraverbal set and condition	Vocal verbal stimulus	Textual prompt
Set 1 fluency	"I like to eat popcorn at the movies."	"Cool, me too, and I like to eat candy."
Set 1 nonfluency	"My favorite game to play is Scrabble."	"I like to play Nintendo with my sister."
Set 2 fluency	"Do you have any pets?"	"I have a dog. His name is Harley."
Set 2 nonfluency	"I like to listen to rock music."	"Awesome, I like to listen to Veggie Tales."

Table 2
Intraverbal Responses Used During Each Condition for Jack

Intraverbal set and condition	Vocal verbal stimulus	Textual prompt
Set 1 fluency	"How was your day?"	"My day was good, how was your day?"
Set 1 nonfluency	"What do you like to do for fun?"	"I like to play games on the computer."
Set 2 fluency	"What do you eat for snack?"	"Pretzels, chips, and Cheetos are my favorite snacks."
Set 2 nonfluency	"What movies do you watch?"	"The movies I like to watch are Disney and Babar."
Set 3 fluency	"Do you have any siblings?"	"Yeah, I have an older and younger brother."
Set 3 nonfluency	"What do you like to do outside?"	"Go on the playground and swing on the swings."

Table 3
Intraverbal Responses Used During Each Condition for John

Intraverbal set and condition	Vocal verbal stimulus	Textual prompt
Set 1 fluency	"Tell me about your school."	"I am in high school at Elim Christian in Palos Heights."
Set 1 nonfluency	"What do doctors do?"	"They take care of sick people and help them get better."
Set 2 fluency	"I like to listen to country music."	"Cool, I listen to High School Musical and Chris Brown."
Set 2 nonfluency	"What is your favorite thing to watch on TV?"	"I like to watch movies, sports, and the Disney Channel."
Set 3 fluency	"What sports do you play?"	"I play baseball and soccer the most."
Set 3 nonfluency	"Are you on any sports teams?"	"Yes, I am on the basketball team."

stimulus control without component skill fluency and transfer of stimulus control with component skill fluency were started using a randomized schedule (Cooper, Heron, & Heward, 2007).

Dependent Variables

The dependent variables included (a) the number of timings to reach frequency aims (a timing denotes an informal reference to timed practice sessions that generally run for fixed time lengths, often 1 min or 30 s), (b) the number of consecutive correct responses to reach criterion for mastery in each phase, and (c) the number of teaching trials to criterion in each condition. For a response to be scored correct, the participant had to pronounce all the example words correctly and respond in a complete sentence. Responses for Fading Levels 0 to 3 were scored correct if they contained all the critical words and were stated in the correct order. For Fading Level 4, responses were scored correct if they contained most of the critical words but omitted a conjunction (e.g., “and,” “or”). Partial responses (if the response contained some of the critical words or if some of the words were correct but were in the wrong order) were considered to be incorrect. If there was no vocal verbal response, if the participant echoed the question, or if the response took longer than 5 s, then responses were scored as passes.

Independent Variables

The effects of two different teaching procedures were assessed. A different intraverbal response was taught in each condition. The first condition was textual fluency and transfer of stimulus control. This procedure took the textual responses taught during textual instruction that comprised the target response for that condition (and were not used in the target response for the alternative condition) and brought them to an accurate and rapid rate before transfer of stimulus control was used to bring the response under intraverbal control. The second procedure was a transfer of stimulus control without textual fluency, in which vocal responding was brought under the control of a textual prompt and the textual prompt was

subsequently faded. All teaching sessions consisted of 10 or fewer trials. When conditions were administered on the same day, at least 30 min elapsed between each session.

Textual fluency. Some textual responses (those included in the target response for this condition) were taught to fluent levels before the transfer of stimulus control procedure was implemented. The experimenter instructed the participant to read the target textual stimuli from a sheet of paper. For Jack, a voice modeling procedure was given at the beginning of the timing (e.g., “you need to read like this: *the, dog*, etc.”). If Jack read a word in an inaudible voice, these textuials were scored incorrect. A correction procedure was used with all participants at the end of each fluency timing. The researcher wrote the missed words, said the missed words, and instructed the participant to repeat the missed words. This procedure was repeated until the participant was able to correctly repeat the textual response three times. Timings were conducted three times per day for at least 2 days per week, and each timing lasted for 30 s. Once the participant was able to engage in textual behavior at a rate of 79 to 90 words per minute with no errors across two timings, transfer of stimulus control began.

Transfer of stimulus control. Vocal verbal responding was brought under the control of a textual prompt, which was then faded to a vocal verbal stimulus. First, the experimenter presented a vocal verbal stimulus (e.g., “I am very cold”). Next, the experimenter flipped over the text (e.g., “It is chilly in here”). The participant had 5 s to begin engaging in textual behavior. If the participant did not respond within 5 s or responded with something that was not related to the verbal stimulus, the response was scored incorrect. If the participant responded correctly, the experimenter provided praise (“excellent job”) and a highly preferred item. There were two correction procedures used depending on the participant’s response. If the participant mispronounced a word, the researcher vocally modeled the correct pronunciation and instructed him to repeat the word three times. Out-of-order responding resulted in the researcher re-presenting the vocal verbal prompt, pointing to the textual

Table 4
Fading Levels Used During Textual Fading

Fading level	Remaining textual prompt	Example script
0	Full textual	"My favorite movies are Batman and Superman."
1	Last three words removed	"My favorite movies are"
2	The first three words available	"My favorite movies"
3	The first two words available	"My favorite"
4	No textual	

cue, and reading the script along with the participant.

Five fading levels were used to transfer control sequentially from the text to a vocal verbal stimulus via backward chaining (Table 4). The criterion for moving through fading levels was set at five consecutive correct responses within a session. If the participant stopped responding or incorrect responding occurred on three occasions within a teaching set, one word was added to the textual prompt until correct responding occurred. The participants were required to emit five consecutive responses with the reintroduced words. Once the participant had reached criterion for the reintroduced words, one word at a time was faded until the stimulus reached the original fading level.

Jack's fading procedure. Jack required additional steps to transfer stimulus control (Table 5). During Level 1, the last three words were removed using the general fading procedure. The difference was that Jack required the entire textual prompt to be reinstated before responding occurred. After responding had reached the criterion of five consecutive responses, backward chaining was used to fade the original textual prompt, starting with the last word.

Generalization and Follow-Up

For John, generalization probes were conducted after the 2-week follow-up for his first set of intraverbals. For Jack and Chris, generalization probes were conducted during 1-week and 2-week follow-ups after the individual date of mastery for each intraverbal. The first set of generalization probes for Week 1 involved a novel person who presented the original statement or question. The generalization probes for Week

2 involved a novel person presenting the vocal verbal stimulus that included the critical features of the original vocal verbal stimulus but varied on some of the noncritical features of the original stimulus. For example, if the original vocal verbal stimulus was "How was your day?" this was changed to "Did you have a good day?" If the participant did not respond or responded incorrectly three consecutive times during the generalization probes, the researcher provided the altered verbal stimulus to determine whether this was enough of the original stimulus to occasion responding. Correct responses were scored if they contained most of the original words taught during intervention. If the participant omitted a conjunction (e.g., "and," "or"), the response was scored as correct. The number of consecutive correct responses across five trials was recorded.

The final phase of the study was conducted simultaneously with the generalization probes. The participant was asked to respond to the

Table 5
Fading Levels Used for Jack During Level 1

Number of words available	Example script
None	"I like to play games on the computer."
7 + letter	"I like to play games on the c"
7	"I like to play games on the"
6 + letter	"I like to play games on t"
6	"I like to play games on"
5 + letter	"I like to play games"

original intraverbals taught during intervention. The researcher provided the vocal stimulus, and the participant was not provided with any of the written texts. These follow-up checks occurred 1 week and 2 weeks after mastery had been achieved for each individual intraverbal. Follow-up sessions included five trials, and the number of consecutive correct responses was recorded.

Interobserver Agreement and Treatment Integrity

Interobserver agreement was calculated by dividing the total number of agreements by the total number of agreements plus disagreements and multiplying by 100%. Interobserver agreement data were collected during 73% of the sessions for fluency and transfer of stimulus control ($M = 100\%$) and 70% of the sessions for transfer of stimulus control without fluency ($M = 98\%$, range, 90% to 100%). Treatment integrity was calculated by taking the number of steps implemented correctly, dividing it by the total number of steps, and multiplying by 100%. Treatment integrity data were collected on 48% of the sessions for fluency and transfer of stimulus control ($M = 100\%$) and 64% of the sessions for transfer of stimulus control without fluency ($M = 99\%$, range, 88% to 100%).

RESULTS AND DISCUSSION

All participants reached the frequency aim of 79 to 90 words read per minute with less than one error. John reached his aim of 84 words read per minute with zero errors across two consecutive sessions after 15 timings. Jack reached his aim of 94 words read per minute with one error after 20 timings. Chris reached his aim of 79 words per minute with zero errors after 22 fluency timings.

Figure 1 displays the cumulative number of trials to criterion for each intraverbal response taught in each experimental condition. For John (top) Intraverbal (IV) Sets 1 and 2 took fewer teaching trials to reach criterion in the fluency condition than the nonfluency condition. IV 3 required a few more teaching trials to reach criterion in the fluency condition than in the nonfluency condition. For Jack (middle), there was not a

difference in the number of teaching trials to criterion for IV 1. IV 2 was acquired more rapidly in the fluency condition, and IV 3 was acquired more rapidly in the nonfluency condition. For Chris (bottom), IV 1 was acquired more rapidly in the fluency condition, and IV 2 was acquired more rapidly in the nonfluency condition.

For John, all three sets of intraverbals were maintained at 1 week and 2 weeks. He did not respond in the generalization probe for IV 1 taught in the fluency condition, but he emitted four consecutive correct responses for IV 1 taught in the nonfluency condition. John continued to respond during generalization and follow-up probes for the remaining intraverbal sets (four or more consecutive correct responses). Jack demonstrated maintenance for IV 1 during the 1-week and 2-week follow-ups for both treatment conditions. He did not respond to the altered vocal verbal stimulus for IV 1 for either treatment condition. In addition, he did not respond during follow-up and generalization for IV 2 or IV 3. Chris maintained IV 1 at the 1-week and 2-week follow-ups even when a different person presented the vocal verbal stimulus. He emitted IV 1 in response to the altered question in the fluency condition but not in the nonfluency condition.

These results suggest that Jack, John, and Chris acquired novel intraverbal responses using transfer of stimulus control. For John, the intraverbal responses were acquired in fewer teaching trials in the fluency condition. This difference was replicated across two intraverbal responses. Jack's data suggest that there was little difference in rate of acquisition between conditions for all three sets of intraverbals. Chris's data were idiosyncratic. One intraverbal was acquired faster in the fluency condition, and one intraverbal was acquired faster in the nonfluency condition. These data suggest that adding a component skill fluency component to transfer of stimulus control procedures may be beneficial for some individuals with developmental disabilities.

There are several possible explanations for why there was not a more consistent difference across conditions. First, there was some overlap in the words used in each textual prompt across conditions (e.g., "and," "is," and "are"). Another explanation may be

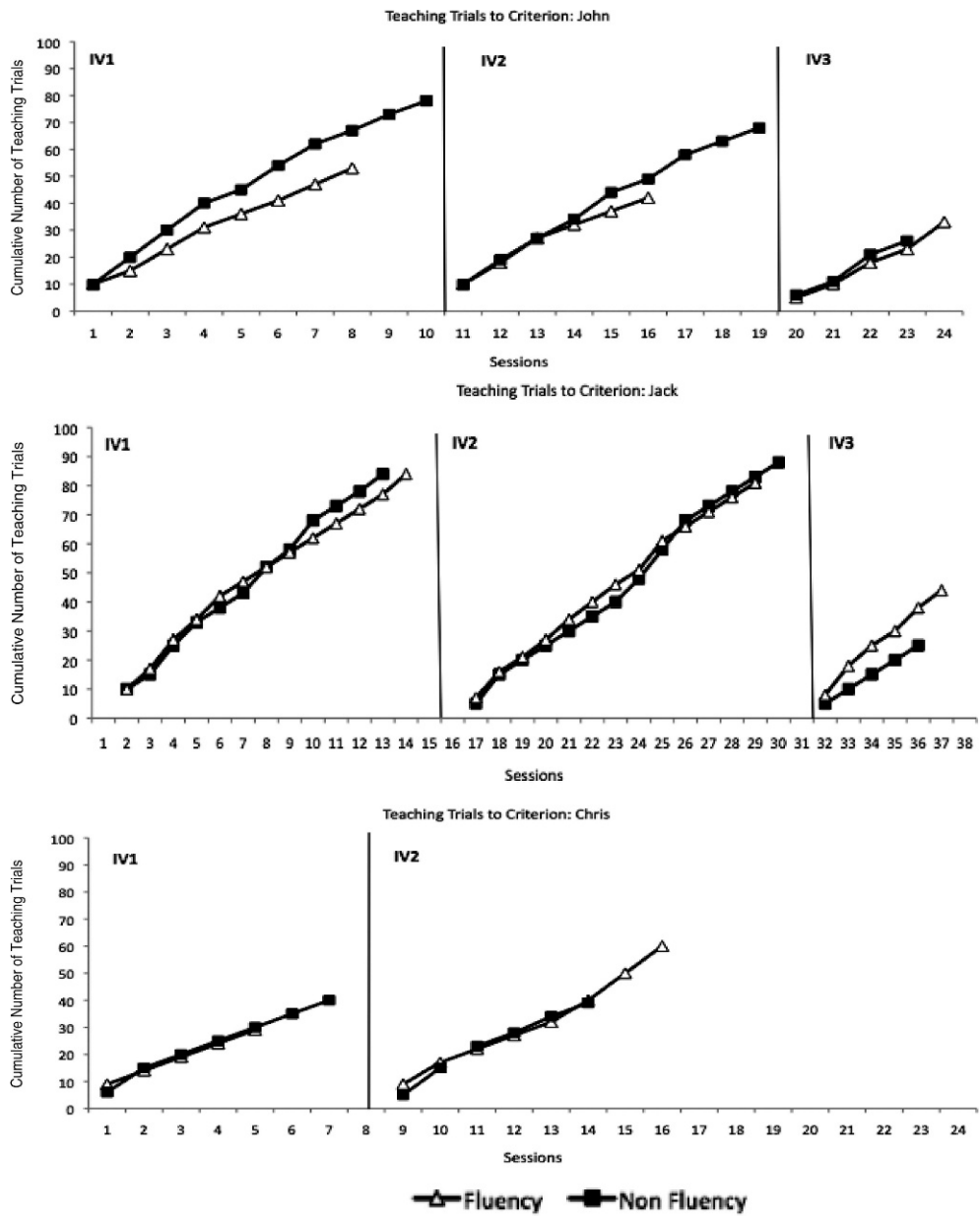


Figure 1. The total number of teaching trials to criterion for fluency and nonfluency conditions for all participants.

related to participants' textual repertoires at the onset of the study. None of the participants were reading at fluent levels prior to reading fluency instruction. However, Jack and Chris had more accurate textual repertoires than John did. It is also possible that the wrong component skills were brought to fluent levels. Specifically, it may be

beneficial to bring the intraverbal responses to levels of fluency or to bring thematically related tact and intraverbal responses to levels of fluency rather than to focus on the textual repertoire.

A major limitation of the study is that the intraverbal responses were chosen arbitrarily. The responses were selected based on reports

from teachers, parents, and direct-care staff. Future researchers should control for the number of verbal conditional discriminations in their selection of vocal verbal stimuli (Axe, 2008).

Intraverbal responding encompasses a large range of our vocal verbal behavior, and it is difficult to teach a specific intraverbal response to every possible controlling stimulus (Skinner, 1957). The lack of responding to varied vocal verbal stimuli in the generalization assessment suggests that the procedures were not sufficient to generate intraverbal responses to different, but similar, vocal verbal stimuli than those used in training. Rather than teaching single responses to a variety of conversational questions and statements using formal prompting only (text), it may be more efficient to teach intraverbal responses based on thematically related conversation topics (e.g., sports, movies, things to do).

The current study extended the findings of Finkel and Williams (2001) and Vedora *et al.* (2009). The procedures introduced new intraverbal responses into all of the participants' vocal verbal repertoires. Even though there were idiosyncratic results across the two treatment conditions, there is some support for the addition of precision teaching to transfer of stimulus control procedures for establishing intraverbal repertoires. Additional research should continue to examine the potential benefits of precision teaching to establish verbal repertoires.

REFERENCES

- Axe, J. B. (2008). Conditional discrimination in the intraverbal relation: A review and recommendations for future research. *The Analysis of Verbal Behavior*, 24, 159–174.
- Barlow, D. H., & Hayes, S. C. (1979). Alternating treatments design: One strategy for comparing the effects of two treatments in a single subject. *Journal of Applied Behavior Analysis*, 12, 199–210.
- Binder, C. (1996). Behavioral fluency: Evolution of a new paradigm. *The Behavior Analyst*, 19, 163–197.
- Binder, C., Haughton, E., & Van Eyk, D. (1990). Increasing endurance by building fluency: Precision teaching attention span. *Teaching Exceptional Children*, 22(3), 24–27.
- Cihon, T. M. (2007). A review of training intraverbal repertoires: Can precision teaching help? *The Analysis of Verbal Behavior*, 23, 121–131.
- Cooper, J. O., Heron, T. E., & Heward, W. L. (2007). *Applied behavior analysis* (2nd ed.). Upper Saddle River, NJ: Prentice Hall.
- Finkel, A. S., & Williams, R. L. (2001). A comparison of textual and echoic prompts on the acquisition of intraverbal behavior in a six-year-old boy with autism. *The Analysis of Verbal Behavior*, 18, 61–70.
- Johnson, K. R., & Layng, T. V. J. (1994). The Morningside model of generative instruction. In R. Gardner, D. Sainato, J. O. Cooper, T. E. Heron, W. L. Heward, J. W. Eshleman, *et al.* (Eds.), *Behavior analysis in education: Focus on measurably superior instruction* (pp. 173–198). Pacific Grove, CA: Brooks/Cole.
- Krantz, P. J., & McClannahan, L. E. (1993). Teaching children with autism to initiate to peers: Effects of a script-fading procedure. *Journal of Applied Behavior Analysis*, 26, 121–132.
- Krantz, P. J., & McClannahan, L. E. (1998). Social interaction skills for children with autism: A script-fading procedure for beginning readers. *Journal of Applied Behavior Analysis*, 31, 191–202.
- Lindsley, O. R. (1972). From Skinner to precision teaching: The child knows best. In J. B. Jordan & L. S. Robbins (Eds.), *Let's try doing something else kind of thing* (pp. 1–11). Arlington, VA: Council for Exceptional Children.
- Merbitz, C., Vieitez, D., Merbitz, N. H., & Binder, C. (2004). Precision teaching: Applications in education and beyond. In D. J. Moran & R. W. Malott (Eds.), *Evidence-based educational methods* (pp. 63–80). San Diego, CA: Elsevier Academic Press.
- Pennypacker, H. S., Gutierrez, A., Jr., & Lindsley, O. R. (2003). *Handbook of the standard celeration chart*. Cambridge, MA: Cambridge Center for Behavioral Studies.

- Skinner, B. F. (1957). *Verbal behavior*. Acton, MA: Copley.
- Starlin, A. (1971). Charting group and individual instruction. *Teaching Exceptional Children*, 3, 135–136.
- Vedora, J., Meunier, L., & MacKay, H. (2009). Teaching intraverbal behavior to children with autism: A comparison of textual and echoic prompts. *The Analysis of Verbal Behavior*, 25, 79–86.